

Concluded

a first polarization separation element for selectively transmitting illumination light of a plane polarization corresponding to the plane polarization of the light incident on said reflection-type image-forming means and selectively reflecting the component of the plane polarization orthogonal to that plane polarization arranged between said light source and said light separating means,

a second polarization separation element formed on a incident facet of the illumination light of said light separating means for selectively transmitting incident light of a predetermined plane polarization corresponding to the plane polarization of said optical image and selectively reflecting the component of the plane polarization orthogonal to that plane polarization arranged between said projection optical system and said light separating means.

REMARKS

The present Amendment and remarks are in response to the Office Action entered in the above identified case and mailed on September 11, 2002. Claims 1-16 are pending in the application. Under 35 U.S.C. §102(b) claims 1 and 5 were rejected as being anticipated by Figs. 1 and 2 of U.S. Patent Number 5,648,860 Ooi et al., and claims 9 and 10 were rejected as being anticipated by U.S. Patent Number 5,621,486 to Doany et al. Claims 11-12 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,988,815 to Bryars. Finally, under 35 U.S.C. §103(a), claims 2-4 and 6-8 were rejected as being obvious over Doany et al. in view of Ooi, and claims 13-16 were rejected over Doany in view of Patent Number 6,111,700 to Kobayashi et al. With this Amendment claims 10 and 12 have been canceled and the subject matter thereof has been incorporated into independent claims 9 and 11 respectively. With respect to all of the remaining claims Applicants respectfully traverse.

Turning first to the rejection of claims 1 and 5 as being anticipated under 35 U.S.C. §102(b) by Ooi et al., Figs. 1 and 2 generally disclose a total of seven elements. These are: a light source 1, a first flat plate type dichroic mirror 21; a second flat plate-type dichroic mirror; first, second and third reflection type liquid crystal optical element blocks 31, 32 and 33, and a projection optical system 4.

Claims 1 and 5 of the present application both call for, among other things, a light separating means for emitting incident light emitted from a light source to a wavelength separation mirror and emitting first and second optical images incident from the wavelength

separation mirror to the a projection optical image. As is clear from a quick perusal of the major components of the system disclosed by Ooi et al., Ooi et al. do not teach any structure which performs the light separating function called for by the light separating means. Ooi et al.'s first and second dichroic mirrors (wavelength separation mirrors) partially reflect light from the light source to the first and second liquid crystal optical element blocks while allowing certain colors to pass. They similarly reflect light from the liquid crystal optical element blocks to a projection optical system. Ooi et al. do not disclose any structure between the light source and the dichroic mirrors or between the dichroic mirrors and the projection optical system. Because Ooi et al. do not disclose this element of claims 1 and 5 of the present application, claims 1 and 5 are not anticipated and should be allowed.

Regarding the rejection of claims 9 and 10 as being anticipated by Doany et al., claim 10 has been cancelled and incorporated into the independent claim 9. Claim 9 now calls for, among other things, a polarization separation element formed on an incident facet of the illumination light side of a light separating means. Doany et al., in contrast teach a polarizing film 40 placed in the illumination path between the lamp 12 and the polarizing beam splitter cube. However, as clearly shown in Fig. 1 of Doany et al.'s disclosure, polarizing film 40 is formed away from the incident facet of the polarizing beam splitter cube. Thus, Doany et al. do not teach a polarization film formed on an incident facet of the illumination light side of the light separating means as called for in the amended claim 9. Since the prior art reference does not teach every element of the claim, the claim is not anticipated and should be allowed.

The situation is similar regarding claims 11 and 12, rejected under 35 U.S.C. §102(e) as being anticipated by Bryars. Claim 12 has been cancelled, and the subject matter of claim 12 has been incorporated into independent claim 11. Claim 11 now calls for, among other things, a polarization separation element formed on an optical image emission facet of the light separating means. Bryars teaches a polarization beam splitter 20, but is utterly silent regarding a polarization separation element formed on an optical image emission facet thereof. The failure of Bryars to teach this claimed feature of the invention means that Bryars does not anticipate amended claim 11, and the claim should be allowed.

Next, Applicant turns to the rejection of claims 2-4 and 6-8 as being obvious in view Doany et al. and Ooi et al. Again, Applicants respectfully traverse. In order to combine references under 35 U.S.C. §103 there must be some teaching or suggestion within the references

themselves or within the knowledge generally available to those skilled in the art that would motivate one of ordinary skill to make the suggested combination. In re Fine 837 F.2d 1071, 5, USPQ2d 1596 (Fed. Cir. 1988). In the present case no such teaching or suggestion exists. In fact, the two references cited by the Examiner actually teach away from making such a combination.

Both Ooi et al. and Doany et al. relate to project type display systems. Both systems operate by selectively reflecting various color bands from a white light illumination source onto reflection type liquid crystal optical elements or light valves (reflection imaging units). The reflection imaging units are electrically driven such that they create optical images from the illumination light reflected from the individual pixels of the imaging units. The reflected images from each of the three different colored reflection imaging units are combined and supplied to an image projection unit where they are displayed as an integrated color image.

A key difference between Ooi et al.'s system and that of Doany et al. is in the operation of the reflection imaging units. The reflection imaging units employed by Ooi et al. rely alternatively on the light scattering and reflective properties of the reflection imaging units to form images, whereas Doany et al. rely on changes in the polarization of light reflected from the reflection imaging units to form their images. At column 12 lines 43-61, Ooi et al. describe how incident light is modulated by the reflection type liquid crystal optical element blocks 31, 32, and 33. The degree of scattering is controlled by the voltage applied to the liquid crystal matrix. Reflected light which is not scattered is collected by a condenser lens adjacent each reflection type liquid crystal optical element block. The three color images are synthesized by a pair of dichroic mirrors and the combined reflected light passes through aperture stop 41. The aperture stop acts to reject scattered light in the vicinity of the focal point of the combined images. Upon passing through the aperture stop, the combined image is projected onto a screen via a projection lens.

In Doany et al.'s system, on the other hand, images are formed by selectively changing the polarization of incident light on the surface the three separate light valves. Due to the effects of a first polarization filter 40 and polarization beam splitter 22 most of the light incident on the light valves is linearly polarized in the same direction. The three light valves are positioned with their reflective surfaces perpendicular to the optical path and serve to spatially modulate the light beam by means of rotation of the polarization of the light and to reflect each of the RGB light

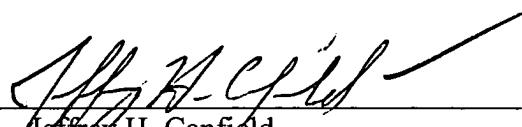
elements back into the optical path such that each of the three elements will retrace its original path through the color prism assembly which serve to recombine the three R, G, B light elements into one light beam, Col. 2, Lines 58-65. Light reflected from the light valves having the same polarization as the incident light is excluded from the image forming beam. The light of polarization rotated relative to the incident beam is selected for forming the projected image via the polarization beam splitter cube 22 Col. 4, Line 67, Col. 5, Line 3. An additional polarization filter 42 is provided to absorb any residual unmodulated light to enhance contrast.

Because of the different operating principles between the two systems, it would make no sense to include the polarization filters and the polarization beam splitter of Doany et al. in Ooi et al.'s system. Selectively removing light of a certain polarization from Ooi et al.'s image beam would have no positive effect because Ooi et al. rely on selectively scattering the incident beam rather than selectively changing the polarization. Thus, the two systems teach away from making the combination suggested by the Examiner. In the absence of any teaching or suggestion for combining the references the rejection of claims 2-4 and 6-8 is improper and should be withdrawn.

Turning now to the rejection of claims 13-16, claim 14 has been canceled and the subject matter thereof has been incorporated into independent claim 13. As has already been discussed with regard to claims 9 and 11, Doany et al. Do not teach or suggest a polarization element formed on a light incident facet of the light separating means, as is now called for in claim 13. According to the Examiner, Kobayashi teaches the known usage of reflection type polarizing means which reflect rather than absorb one of the components. However, even when such a filter is disclosed, the combined teaching of the references does not teach such a filter formed on the incident facet of a light separation means as called for by independent claim 13. Thus, even when Doany et al. and Kobayashi are combined they do not teach every element of the claim invention and independent claim 13 and dependent claims 15 and 16 are not obvious in light thereof. Accordingly, claims 13, 15 and 16 should be allowed.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

9. A projection-type display device, comprising:
a reflection-type image-forming means for spatially modulating and reflecting illumination light of a predetermined plane polarization to emit an optical image with a plane polarization rotated with respect to the plane polarization of the illumination light,
a projection optical system for projecting said optical image,
a light source for emitting said illumination light, and
a light separating means for emitting said illumination light emitted from said light source toward said reflection-type image-forming means and emitting said optical image emitted from said reflection-type image-forming means to said projection optical system,
a polarization separation element formed on an incident facet of the illumination light of said light separating means for selectively transmitting illumination light of a plane polarization corresponding to the plane polarization of the light incident on said reflection-type image-forming means and selectively reflecting the component of the plane polarization orthogonal to that plane polarization arranged between said light source and said light separating means.

11. A projection-type display device, comprising:
a reflection-type image-forming means for spatially modulating and reflecting illumination light of a predetermined plane polarization to emit an optical image with a plane polarization rotated with respect to the plane polarization of the illumination light,
a projection optical system for projecting said optical image,
a light source for emitting said illumination light, and
a light separating means for emitting said illumination light emitted from said light source toward said reflection-type image-forming means and emitting said optical image emitted from said reflection-type image-forming means to said projection optical system,
a polarization separation element formed on an emission facet of the optical image of said light separating means for selectively transmitting incident light of a predetermined plane polarization corresponding to the plane polarization of said optical image and selectively

reflecting the component of the plane polarization orthogonal to that plane polarization arranged between said projection optical system and said light separating means.

13. A projection-type display device, comprising:

a reflection-type image-forming means for spatially modulating and reflecting illumination light of a predetermined plane polarization to emit an optical image with a plane polarization to emit an optical image with a plane polarization rotated with respect to the plane polarization of the illumination light,

a projection optical system for projecting said optical image,

a light source for emitting said illumination light, and

a light separating means for emitting said illumination light emitted from said light source toward said reflection-type image-forming means and emitting said optical image emitted from said reflection-type image-forming means to said projection optical system,

a first polarization separation element for selectively transmitting illumination light of a plane polarization corresponding to the plane polarization of the light incident on said reflection-type image-forming means and selectively reflecting the component of the plane polarization orthogonal to that plane polarization arranged between said light source and said light separating means,

a second polarization separation element formed on a incident facet of the illumination light of said light separating means for selectively transmitting incident light of a predetermined plane polarization corresponding to the plane polarization of said optical image and selectively reflecting the component of the plane polarization orthogonal to that plane polarization arranged between said projection optical system and said light separating means.